

Application No.: 10/697,208
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AMENDMENTS TO THE CLAIMS

1. (original) A system for reproducing audio signals, comprising:

at least one source of audio signals, the audio signals corresponding to at least one audio channel;

a modulated signal generator configured to generate an ultrasonic carrier signal modulated with at least one of the audio signals;

a driver amplifier configured to amplify the modulated ultrasonic carrier signal; and

at least one directional loudspeaker, the directional loudspeaker including at least one acoustic transducer configured to receive the modulated ultrasonic carrier signal amplified by the driver amplifier, and to project a sound beam representing the modulated ultrasonic carrier signal through a propagation medium along a pre-selected path to reproduce the at least one audio signal along at least a portion of the path.

2. (original) The system of claim 1 wherein the audio signals correspond to a plurality of audio channels, wherein the at least one directional loudspeaker comprises a plurality of directional

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loudspeakers, and wherein a separate audio channel is provided for each directional loudspeaker.

3. (original) The system of claim 1 wherein the audio signals correspond to a plurality of audio channels, and wherein the modulated signal generator is configured to combine the plurality of audio channels and to generate the ultrasonic carrier signal modulated with the combined audio channels.

4. (currently amended) The system of claim 1 wherein the audio signals correspond to a plurality of audio channels, the plurality of audio channels being selected from the group consisting of a first audio channel corresponding to a first location in front of a user of the system, a second audio channel corresponding to a second location in back of the system user, a third audio channel corresponding to a third location to the left of the system user, and a fourth audio channel corresponding to a fourth location to the right of the system user, and wherein the modulated signal generator is configured to combine the plurality of audio channels, and to generate the ultrasonic carrier signal modulated with the combined audio channels.

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5. (currently amended) The system of claim 1:
wherein the directional loudspeaker is a parametric array;
wherein the system further includingincludes a parametric
array processor configured to control the parametric array, and at
least one sensor configured to detect a distance from the
directional loudspeaker to a user of the system or to detect a
position of the user relative to the system; and
wherein the parametric array processor is configured to allow
at least one parameter thereof to be adjusted based upon one or
more of the detected distance from the directional loudspeaker to
the user of the system, and the detected position of the user
relative to the system.

6. (original) The system of claim 5 wherein the modulated signal generator is configured to generate an ultrasonic signal having characteristics based at least in part on the detected distance to the system user or the detected position of the system user.

7. (original) The system of claim 5 wherein the sensor comprises a device selected from the group consisting of an optical ranging device, an acoustic ranging device, and an infrared ranging device.

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8. (original) The system of claim 1 wherein the acoustic transducer is selected from the group consisting of a piezoelectric transducer, an electrostatic transducer, a PVDF film transducer, and an electrostrictive film transducer.

9. (original) The system of claim 1 further including a delay circuit configured to apply a relative phase shift across a plurality of frequencies of the modulated ultrasonic carrier signal to steer, focus, or shape the sound beam projected by the directional loudspeaker.

10. (currently amended) The system of claim 1:

wherein the system is selected from the group consisting of a television, a radio, an audio tape player, a phonograph, a compact disk player, a digital video disk player, a laser disk player, a video game, a desktop computer, a laptop computer, and an MP3 system; and

wherein the directional loudspeaker is configured to direct the sound beam along the pre-selected path toward a user of the system, thereby preventing individuals other than the system user from hearing sound produced by the system.

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11. (original) The system of claim 1 further including a second amplifier and at least one non-directional loudspeaker, the second amplifier being configured to amplify one or more audio signals corresponding to at least one of the audio channels and to drive at least one non-directional loudspeaker.

12. (original) The system of claim 11 wherein the modulated signal generator and the second amplifier are configured to receive the at least one audio channel in parallel.

13. (original) The system of claim 11 wherein the modulated signal generator is configured to receive the at least one audio channel and to provide a representation of the at least one audio channel to the second amplifier.

14. (original) The system of claim 11 wherein the modulated signal generator is configured to selectively generate the ultrasonic carrier signal modulated with the at least one of the audio signals, and the second amplifier is configured to selectively amplify the one or more audio signals, thereby allowing only the directional loudspeaker, only the non-directional

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loudspeaker, or both the directional loudspeaker and the non-directional loudspeaker, to reproduce the audio signals.

15. (original) The system of claim 1 wherein the modulated signal generator includes an independent volume control.

16. (original) The system of claim 1 further including a remote signal receiver and a remote control device configured to generate remote signals in response to a user input, wherein the remote signal receiver is configured to receive the remote signals and generate control signals for controlling a system characteristic selected from the group consisting of a volume setting, a tone setting, and an output switch selection.

17. (original) The system of claim 16 wherein the remote control device is selected from the group consisting of an optical remote control device, an acoustic remote control device, an infrared remote control device, and a radio frequency remote control device.

18. (original) The system of claim 1 further including a fan configured to cool the system.

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19. (original) The system of claim 18 wherein the fan is activated automatically when a system temperature exceeds a predetermined level.

20. (currently amended) The system of claim 1 further including a swing-arm assembly configured to mount the directional loudspeaker to a ceiling, a floor, or a wall, and to direct of the projected sound beam along the pre-selected path.

21. (currently amended) The system of claim 1 further including a clamp assembly configured to mount the directional loudspeaker to a ceiling, a floor, or a wall, and to direct of the projected sound beam along the pre-selected path.

22. (original) A method of reproducing audio signals, comprising the steps of:

providing at least one audio signal by at least one audio source, the at least one audio signal corresponding to at least one audio channel;

generating an ultrasonic carrier signal modulated with at least one audio signal by a modulated signal generator;

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amplifying the modulated ultrasonic carrier signal by a driver amplifier;

receiving the modulated ultrasonic carrier signal amplified by the driver amplifier by at least one directional loudspeaker including at least one acoustic transducer; and

projecting a sound beam representing the modulated ultrasonic carrier signal through a propagation medium along a pre-selected path to reproduce the at least one audio signal along at least a portion of the path by the at least one directional loudspeaker.

23. (original) The method of claim 22 wherein the audio signals correspond to a plurality of audio channels, wherein the at least one directional loudspeaker comprises a plurality of directional loudspeakers, and further including the step of providing a separate audio channel for each directional loudspeaker.

24. (original) The method of claim 22 wherein the audio signals correspond to a plurality of audio channels, and further including the steps of combining the plurality of audio channels by the modulated signal generator, and generating the ultrasonic carrier signal modulated with the combined audio channels by the modulated signal generator.

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25. (currently amended) The method of claim 22:

wherein the audio signals correspond to a plurality of audio channels, the plurality of audio channels being selected from the group consisting of a first audio channel corresponding to a first location in front of a user of the system, a second audio channel corresponding to a second location in back of the system user, a third audio channel corresponding to a third location to the left of the system user, and a fourth audio channel corresponding to a fourth location to the right of the system user; and

wherein the method further includes the steps of combining, by the modulated signal generator, the plurality of audio channels, and generating the ultrasonic carrier signal modulated with the combined audio channels.

26. (currently amended) The method of claim 22:

wherein the directional loudspeaker is a parametric array controlled by a parametric array processor; and

wherein the method further including includes the step steps
of:

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detecting a distance from the directional loudspeaker to a user of the system or detecting a position of the user relative to the system by at least one sensor; and

adjusting at least one parameter of the parametric array processor based upon one or more of the detected distance from the directional loudspeaker to the user of the system, and the detected position of the user relative to the system.

27. (original) The method of claim 26 wherein the generating step includes generating an ultrasonic signal having characteristics based at least in part on the detected distance to the system user or the user position.

28. (original) The method of claim 26 wherein the sensor comprises a device selected from the group consisting of an optical ranging device, an acoustic ranging device, and an infrared ranging device.

29. (original) The method of claim 22 wherein the acoustic transducer is selected from the group consisting of a piezoelectric transducer, an electrostatic transducer, a PVDF film transducer, and an electrostrictive film transducer.

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30. (original) The method of claim 22 further including the step of applying a relative phase shift across a plurality of frequencies of the modulated ultrasonic carrier signal by a delay circuit, thereby steering, focusing, or shaping the sound beam projected by the directional loudspeaker.

31. (currently amended) The method of claim 22:

wherein the system is selected from the group consisting of a television, a radio, an audio tape player, a phonograph, a compact disk player, a digital video disk player, a laser disk player, a video game, a desktop computer, a laptop computer, and an MP3 system; and

wherein the method further includes the step of directing the sound beam along the pre-selected path toward a user of the system, thereby preventing individuals other than the system user from hearing sound produced by the system.

32. (original) The method of claim 22 further including the step of amplifying one or more audio signals corresponding to at least one of the audio channels by a second amplifier, and driving at least one non-directional loudspeaker by the second amplifier.

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33. (original) The method of claim 32 further including the step of receiving the at least one audio channel in parallel by the modulated signal generator and the second amplifier.

34. (original) The method of claim 32 further including the steps of receiving the at least one audio channel by the modulated signal generator, and providing a representation of the at least one audio channel to the second amplifier by the modulated signal generator.

35. (original) The method of claim 32 further including the steps of selectably generating the ultrasonic carrier signal modulated with the at least one of the audio signals by the modulated signal generator, and selectably amplifying the one or more audio signals by the second amplifier, thereby allowing only the directional loudspeaker, only the non-directional loudspeaker, or both the directional loudspeaker and the non-directional loudspeaker, to reproduce the audio signals.

36. (original) A telephone system, comprising:

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a receiver configured to receive information representative of at least one audio signal;

a modulated signal generator configured to generate an ultrasonic carrier signal modulated with the at least one audio signal;

a driver amplifier configured to amplify the modulated ultrasonic carrier signal; and

at least one directional loudspeaker, the directional loudspeaker including at least one acoustic transducer configured to receive the modulated ultrasonic carrier signal amplified by the driver amplifier, and to project a sound beam representing the modulated ultrasonic carrier signal through a propagation medium along a pre-selected path to reproduce the at least one audio signal along at least a portion of the path.

37. (original) The system of claim 36 further including a second amplifier and at least one non-directional speaker, the second amplifier being configured to amplify at least one audio signal and to drive the non-directional loudspeaker.

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38. (original) The system of claim 37 wherein the modulated signal generator and the second amplifier are configured to receive the at least one audio channel in parallel.

39. (original) The system of claim 37 wherein the modulated signal generator is configured to receive the at least one audio channel and to provide a representation of the at least one audio channel to the second amplifier.

40. (original) The system of claim 37 wherein the modulated signal generator is configured to selectably generate the ultrasonic carrier signal modulated with the at least one of the audio signals, and the second amplifier is configured to selectably amplify the one or more audio signals, thereby allowing only the directional loudspeaker, only the non-directional loudspeaker, or both the directional loudspeaker and the non-directional loudspeaker, to reproduce the audio signals.

41. (original) A method of operating a telephone system, comprising the steps of:

receiving information representative of at least one audio signal by a receiver;

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generating an ultrasonic carrier signal modulated with the at least one audio signal by a modulated signal generator;

amplifying the modulated ultrasonic carrier signal by a driver amplifier;

receiving the modulated ultrasonic carrier signal amplified by the driver amplifier by at least one directional loudspeaker including at least one acoustic transducer; and

projecting a sound beam representing the modulated ultrasonic carrier signal through a propagation medium along a pre-selected path by the directional loudspeaker, thereby reproducing the at least one audio signal along at least a portion of the path.

42. (original) The method of claim 41 further including the steps of amplifying at least one audio signal by a second amplifier, and driving at least one non-directional loudspeaker by the second amplifier.

43. (original) The method of claim 42 further including the step of receiving the at least one audio signal in parallel by the modulated signal generator and the second amplifier.

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44. (original) The method of claim 42 further including the steps of receiving the at least one audio channel by modulated signal generator, and providing a representation of the at least one audio channel to the second amplifier by the modulated signal generator.

45. (original) The method of claim 42 further including the steps of selectably generating the ultrasonic carrier signal modulated with the at least one of the audio signals by the modulated signal generator, and selectably amplifying the one or more audio signals by the second amplifier, thereby allowing only the directional loudspeaker, only the non-directional loudspeaker, or both the directional loudspeaker and the non-directional loudspeaker, to reproduce the audio signals.